

## CLAIMS

What is claimed is:

*SJ*  
*AI*

1. A parametric shape grammar interpreter, comprising:  
a shape decomposition module; and  
a shape recognition module in communication with the shape decomposition module.

2. The parametric shape grammar interpreter of claim 1, wherein the shape decomposition module is for decomposing a left-hand shape of a shape grammar rule into at least one subshape belonging to one of a plurality of subshape groups.

3. The parametric shape grammar interpreter of claim 2, wherein the subshape groups have a hierarchical order of decreasing constraints.

4. The parametric shape grammar interpreter of claim 2, wherein the shape decomposition module is for decomposing a two-dimensional left-hand shape of a shape grammar rule into the subshape.

5. The parametric shape grammar interpreter of claim 2, wherein the shape decomposition module is for decomposing a three-dimensional left-hand shape of a shape grammar rule into the subshape.

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6. The parametric shape grammar interpreter of claim 2, wherein the shape decomposition module is for decomposing a one-dimensional left-hand shape of a shape grammar rule into the subshape.
7. The parametric shape grammar interpreter of claim 2, wherein the shape recognition module is for searching a shape for a parametric transformation of the subshape.
8. The parametric shape grammar interpreter of claim 2, wherein the shape recognition module is for recognizing a parametric transformation of the left-hand shape of the shape grammar rule in a first shape by searching the first shape for a parametric transformation of the subshape.
9. The parametric shape grammar interpreter of claim 8, wherein the shape recognition module is for recognizing a parametric transformation of the left-hand shape of the shape grammar rule in a first shape by progressively searching for a parametric transformation of a subshape belonging to each of the subshape groups that is not null and subtracting the parametric transformation from the first shape.
10. A parametric shape interpreter, comprising:  
a shape decomposition module for decomposing a first shape into at least one subshape belonging to one of a plurality of subshape groups; and  
a shape recognition module in communication with the shape decomposition module.

11. The parametric shape interpreter of claim 10, wherein the shape recognition module is for searching a second shape for a parametric transformation of the subshape.

12. A shape grammar system, comprising:

a parametric shape grammar interpreter for recognizing parametric transformations of a first shape in a second shape; and  
a rule application module in communication with the parametric shape grammar interpreter.

13. The shape grammar system of claim 12, wherein the parametric shape grammar interpreter includes:

a shape decomposition module and

a shape recognition module in communication with the shape decomposition module.

14. The shape grammar system of claim 13, wherein the shape decomposition module is for decomposing a left-hand shape of a shape grammar rule into at least one subshape belonging to one of a plurality of subshape groups.

15. The shape grammar system of claim 14, wherein the subshape groups have a hierarchical order of decreasing constraints.

16. The shape grammar system of claim 15, wherein the shape recognition module is for recognizing a parametric transformation of the left-hand shape of the shape grammar rule in a first shape by searching the first shape for a parametric transformation of the subshape.

17. The shape grammar system of claim 16, wherein the shape recognition module is for recognizing a parametric transformation of the left-hand shape of the shape grammar rule in a first shape by progressively searching for a parametric transformation of a subshape belonging to each of the subshape groups that is not null and subtracting the parametric transformation from the first shape.

18. The shape grammar system of claim 16, wherein the rule application module is for applying the shape grammar rule by subtracting the parametric transformation of the left-hand shape of the shape grammar rule from the first shape and substituting therefor a transformation of a right-hand shape of the shape grammar rule.

19. The shape grammar system of claim 12, further comprising an intelligent rule selection module in communication with the parametric shape grammar interpreter.

20. A parametric shape grammar interpreter, comprising:  
means for decomposing a left-hand shape of a shape grammar rule into at least one subshape belonging to one of a plurality of subshape groups; and

means for recognizing a parametric transformation of the left-hand shape of the shape grammar rule in a first shape by searching the first shape for a parametric transformation of the subshape.

21. The parametric shape grammar interpreter of claim 20, wherein the subshape groups have a hierarchical order of decreasing constraints.

22. The parametric shape grammar interpreter of claim 20, wherein said means for recognizing includes means for recognizing a parametric transformation of the left-hand shape of the shape grammar rule in the first shape by progressively searching for a parametric transformation of a subshape belonging to each of the subshape groups that is not null and subtracting the parametric transformation from the first shape.

23. The parametric shape grammar interpreter of claim 22, wherein the means for recognizing includes means for adding a parametric transformation of a first subshape found in the first shape belonging to a first of the subshape groups and a parametric transformation of a second subshape found in a second shape belonging to a second of the subshape groups, wherein the second shape corresponds to the first subshape subtracted from the first shape.

24. A parametric shape interpreter, comprising:  
means for decomposing a first shape into at least one subshape belonging to one of a plurality of subshape groups; and

means for recognizing a parametric transformation of the first shape in a second shape by searching the second shape for a parametric transformation of the subshape.

25. A method of recognizing parametric transformations of a left-hand shape of a shape grammar rule in a first shape, comprising:

decomposing the left-hand shape of the shape grammar rule into at least one subshape belonging to one of a plurality of subshape groups; and

searching the first shape for a parametric transformation of the subshape.

26. The method of claim 25, wherein searching the first shape includes progressively searching the first shape for a parametric transformation of a subshape belonging to each of the subshape groups that are not null and subtracting the parametric transformation from the first shape.

27. A method of recognizing parametric transformations of a left-hand shape of a shape grammar rule in a first shape, comprising:

searching the first shape for a parametric transformation of a first subshape of the left-hand shape of the shape grammar rule;

generating a second shape corresponding to the parametric transformation of the first subshape, found in the first shape, subtracted from the first shape;

searching the second shape for a parametric transformation of a second subshape of the left-hand shape of the shape grammar rule; and

adding the parametric transformation of the first subshape found in the first shape to a parametric transformation of the second subshape found in the second shape.

28. The method of claim 27, further comprising:

generating a third shape corresponding to the parametric transformation of the second subshape subtracted from the second shape;

searching the third shape for a parametric transformation of a third subshape of the left-hand shape of the shape grammar rule; and

adding the parametric transformation of the third subshape found in the third shape to a sum of the parametric transformation of the first subshape found in the first shape and the parametric transformation of the second subshape found in the second shape.

29. The method of claim 27, further comprising:

subtracting a sum of the parametric transformation of the first subshape found in the first shape and the parametric transformation of the second subshape found in the second shape from the first shape; and

adding a corresponding transformation of a right-hand shape of the shape grammar rule to the first shape.

30. A method of recognizing a first shape in a second shape, comprising:

decomposing the first shape into at least one subshape belonging to one of a plurality of subshape groups; and

searching the second shape for a parametric transformation of the subshape.

31. The method of claim 30, wherein searching the second shape includes progressively searching the second shape for a parametric transformation of a subshape belonging to each of the subshape groups that are not null and subtracting the parametric transformation from the second shape.

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